

Appendix 2. Six Sets of Regressive Shorelines Lower than Highstand of Long Valley Lake

In five tracts along the west side of Pleistocene Long Valley Caldera lake, sets of 3–5 paleoshorelines are weakly preserved where etched into gently sloping aprons of silica-cemented littoral sandstone and pebble conglomerate that were deposited against the toe of postcaldera early rhyolite lavas (750–640 ka). Each tract is $\sim 1 \text{ km}^2$ or smaller in area and is extensively but incompletely mantled by a thin sheet of sandy-silty post-lake colluvium in which pebbles are almost exclusively subangular rhyolite. The colluvium was never wave-worked and is presumed to have been deposited secularly by post-lake aeolian and sheetwash processes. The shoreline sets are discernible from a distance in low-angle light but are generally unrecognizable when visited on foot. The upper shoreline of each tract is 60–110 m lower than nearby remnants of highstand gravel or sandstone. Most sandstone exposures were disrupted by wave action subsequent to strong induration, leaving patches of loosened or tilted bedded slabs.

All five sets are on the lower slope of the caldera's resurgent uplift; thus, along with the adjacent highstand, they have been tilted upward relative to their original levels. From north to south, the five are described as follows. A sixth set is on the east side of the Pleistocene lake basin and is described last.

1. Centered at UTM 03375/41754 at elevations 2,150–2,180 m, the northernmost tract consists of as many as five shorelines etched into a sandstone apron that laps onto a coulee of early rhyolite and slopes $1\text{--}3^\circ \text{ N}$. The shorelines are preserved for $\sim 1.5 \text{ km}$ east-west and are discontinuously covered by colluvium 0–2 m thick. The wedge of silica-cemented sandstone is as thick as 20–30 m where banked against the rhyolite lava and exposed by an arroyo at the west end of the tract.

2. Centered at UTM 0339/4174 at elevations 2,140–2,160 m, this tract is etched into the sandstone apron north of Little Hot Creek where the apron laps onto the east edge of the same early rhyolite coulee as tract 1. Four shorelines are discernible, and a weak fifth one may mark the toe of the rhyolite lava up at 2,180 m. The slope of the silica-cemented sandstone apron is $\sim 4^\circ \text{ E}$. at its west (uphill) limit but lessens eastward to $\sim 1^\circ \text{ E}$. Numerous windows of sandstone and disrupted sandstone slabs are exposed through a thin veneer of sandy-silty post-lake colluvium, which is armored by a deflated lag of granules, chips, and flakes of rhyolite and subordinate sandstone fragments.

3. Centered at UTM 03373/4172 at elevations 2,150–2,190 m, this tract is etched into the sandstone apron south of the Antelope Springs Road, where the apron slopes $3\text{--}5^\circ \text{ ENE}$. away from brecciated outliers of early rhyolite lava. Four low-profile shorelines are vaguely discernible in low-angle light from a distance. Patchy exposures of sandstone, commonly of broken slabs, are exposed through an extensive veneer of sandy-silty colluvium that carries granules and angular flakes (1–25 mm) of rhyolite and lesser amounts of sandstone. No nonindurated beach deposits are present, and well-rounded rhyolite pebbles are very rare.

4. Centered at UTM 03367/4170 at 2,185–2,200 m, this tract consists of three shorelines (weakly discernible only from a distance) etched into a gently east-sloping ($\sim 1^\circ \text{ E}$.) sandstone apron that laps

against the toe of the southeasternmost coulee of early rhyolite. The tract lies west of the northern snout of the Hot Creek flow and just south of the silicified locality called “blue chert.” Although sandstone outcrop is extensive just downslope from the shoreline tract; its exposure within the tract is poor, owing to a colluvial veneer (0–3 m thick) that has spread downslope from a 60-m-high scarp of early rhyolite. The sand-and-silt-dominated colluvium carries abundant granules and flakes of obsidian and felsite (1–30 mm) and sparser plates of sandstone (50–200 mm).

5. Centered at UTM 03368/41684 at elevations 2,160–2,200 m, this set of several shorelines is etched into an apron of silica-cemented sandstone and pebble conglomerate that laps the toe of early rhyolite knoll 2251, ~1 km north of the Hot Creek Fish Hatchery. The apron slopes 3–5° SE., and the treads and risers of its shorelines are better defined (fig. 7) than in the other five tracts. A veneer of post-lake sandy-silty colluvium carries abundant granules and flakes of rhyolite, but its patchy discontinuity permits extensive outcrop of the stratified sandstone, much of which was disrupted by wave action long after induration. On the lowest bench, the colluvial veneer was augmented by postlake Pleistocene Hot Creek alluvium rich in metasedimentary, granitic, and basaltic pebbles as well as in the rhyolite pebbles that dominate the higher shorelines.

6. Centered at UTM 0350/41668 at elevations 2,170–2,190 m, this tract of three or four poorly preserved shorelines lies ~600 m south of the Watterson Canyon highway, on the east side of Pleistocene Long Valley Caldera lake. The shorelines are developed on nonindurated primary pyroclastic deposits of Glass Mountain rhyolite. Unlike erosional tracts 1–5, this set of shorelines is in part constructional in the sense that wave action redistributed the loose pyroclastic deposits. Surfaces are dominated by well-rounded rhyolite pebbles (1–3 cm) scattered in a sandy-silty colluvial veneer, but deflated patches and arroyo sidewalls expose coarser shingle (1–10 cm cobbles and pebbles) that may be as thick as 10–15 m. Clasts are all Glass Mountain rhyolite and do not include pieces of Bishop Tuff, a few eroded outcrops of which do survive locally, including a prominent mesa just west of the shoreline tract. Most of the Bishop Tuff was stripped subaerially from this surface before the lake rose to this level and subsequently promoted shoreline construction and rounding of Glass Mountain rhyolite pebbles. Like tracts 1–5, shorelines here are weakly discernible from a distance in low-angle light but are virtually unrecognizable on foot. The well-defined highstand shoreline is as high as 2,280 m in elevation (fig. 4) about 1.5 km east of this tract, ~100 m higher than these regressional shorelines.